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REMARKS

Claims 1-4, 6 and 8-21 are in the application. Claims 5 and 7 are cancelled.

By this amendment, claims 1, 4, 9, 10, 11 have been amended to more particularly point out and distinctly claim the subject matter that applicants regard as their invention. Applicants' specification from paragraph [0012] to paragraph [0031] and FIG. 1 support the changes to claims 1 and 10. Applicants' specification at paragraph [0033] supports the changes to claim 4. Applicants' specification at paragraph [0017] supports the changes to claims 9 and 11.

The Present Final Rejection is Premature

Pursuant to M.P.E.P §706.07(c), applicants respectfully submit that the present final rejection is premature for at least the following reasons. In particular, the Examiner has mistakenly overlooked express elements in, for example, previously presented claim 17 that are neither shown nor suggested in the prior art cited in the present office action. Given this oversight, applicants respectfully believe they should have the opportunity to further the prosecution of the present application without the unnecessary and burdensome expense of an appeal or a continuing application. Thus, applicants respectfully request that Examiner Rose withdraw the final designation and reopen prosecution on the merits.

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Submission of Present Amendment is Respectfully Requested

In the alternative and pursuant to 37 C.F.R. 1.116(b)(2) & (3), applicants further believe that this amendment places their application in better form for allowance or consideration on appeal. Moreover, applicants respectfully believe that this amendment touches on the merits of their application, and they did not present the amendments and remarks made herein until now because new grounds for rejection were first raised in the present Office Action to which this amendment is responsive to.

Applicants therefore respectfully request that Examiner Rose grant the admission of the present amendment under 37 C.F.R. 1.116(b)(2) & (3) if she decides not to withdraw the final rejection as requested above.

Response to 35 U.S.C. §112 Rejection

Claim 11 was rejected under 35 U.S.C. 112, second paragraph as being indefinite. Applicants have amended claim 11 and believe that claim 11 now meets the requirements of §112, second paragraph. Additionally, non-limiting examples of the elements set forth in claim 11 are shown in FIG. 1 as extended drain region 26 and p-top region 27, which are explained further in paragraph [0017] of applicants' specification.

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10/797,537Responses to 35 U.S.C. §103(a) Rejection

Claims 1-6 and 8-21 were rejected under 35 U.S.C. §103(a) over Tihanyi, U.S. Patent No. 6,507,071 (hereafter "Tihanyi") in view of Disney, U.S. Patent No. 6,509,220 (hereafter "Disney"). Applicants first note that the rejection to claim 5 is now moot in view of its cancellation. Applicants respectfully traverse the rejection of claims 1-4, 6 and 8-21 in view of the amendments made herein and the arguments present hereinafter.

Claim 1 calls for a lateral IGFET device comprising a semiconductor substrate having a first conductivity type. A region of semiconductor material comprising alternating layers of first and second conductivity type material is deposited over the semiconductor substrate and has a first major surface, the region of semiconductor material further includes a top layer of the first conductivity type formed adjacent the first major surface and one of the alternating layers of the second conductivity type is formed adjacent and below the top layer. A drain region of the second conductivity type extends from the first major surface into at least a portion of the region of semiconductor material and adjoins at least a portion of the alternating layers.

Claim 1 further calls for a body region of the first conductivity type formed in a portion of the region of semiconductor material and extends from the first major surface partially into the top layer. A first source region is formed in the body region. A trench gate structure is formed in a portion of the region of semiconductor material and adjoins the alternating layers, the body region and the first source region, wherein the trench gate structure

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controls a sub-surface channel region. A surface gate structure including a gate dielectric layer is formed overlying the first major surface and a gate electrode layer overlies the gate dielectric layer, wherein the surface gate structure extends over the first source region and controls conduction in a surface channel region.

I. Applicants first submit that there is no motivation to combine the Tihanyi and Disney references.

It is widely accepted that in order for a prima facie case to stand under 35 U.S.C. §103(a), there must be motivation to combine the references cited. Where a proposed modification would destroy the function of a reference, this is strong evidence against motivation to combine. In re Haruna 249, F.3d 1327, 58 U.S.P.Q.2d 1517 (Fed. Cir. 2001). Additionally, if there is conflict between the references, such conflict goes against motivation to combine. In re Young 927 F.2d 588, 591, 18 U.S.P.Q.2d 1089, 1091 (Fed. Cir. 1991). Further, if the prior art teaches away, such a teaching is strong evidence of non-obviousness. Winner Int'l Royalty Corp. v. Ching-Rong Wang, 202 F.3d 1340, 53 U.S.P.Q.2d 1580 (Fed. Cir. 2000).

Applicants respectfully submit that there is no motivation to combine the Tihanyi and Disney because the proposed combination of references would destroy the function of a reference, or in the alternative, there is direct conflict between the teachings of the two references. Specifically, in Tihanyi, the alternating layers 3 and 4 extend between and adjoin both the gate region 12/14 and the drain region 9. However, in Disney, the alternating p-type

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buried layers do not adjoin either the gate region nor the drain region. Further, as stated in Disney Column 7, lines 47-60, this is done intentionally in order to improve the breakdown voltage of the Disney embodiment. In fact, Disney expressly states that the "P-type buried layer regions [are] surrounded above, below, and laterally by N-type material." Based on this express statement, applicants respectfully submit that there is no motivation to combine the references for any purposes because the function of the Disney device would be destroyed (i.e., degradation in breakdown voltage), or because there is direct conflict (i.e., degradation in breakdown voltage) between the teachings of the two references.

Moreover, the Tihanyi device employs a field shaping plate 15 embedded in a thick dielectric layer 16 overlying the entire surface of the Tihanyi device. Further, plate 15 extends all the way from the edge of gate 12/13 to the edge of drain 9. Applicants respectfully submit that there is no motivation to combine Tihanyi and Disney because the presence of plate 15 and thick dielectric layer 16 in the Tihanyi device teaches away from the surface gate device shown in Disney's FIG. 6 embodiment. Specifically, since the Tihanyi device is a trench gate sub-surface channel device only with a very thick dielectric layer 16 with an embedded field plate 15 overlying the entire major surface, this structure teaches away and provides no motivation to include a surface gate device for controlling a surface channel region.

In view of the above, applicants respectfully believe that a prima facie case of obviousness has not been presented, and further believe that claims 1-4, 6, 8, and 9 are allowable for at least this reason.

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II. Even if motivation existed, the two references still fail to show or suggest each element set forth in claim 1.

Assuming arguendo that there is motivation to combine the references, applicants respectfully submit that the Examiner has resorted to using their specification as a roadmap to pick and choose elements from the Disney reference when there is no motivation to do so absent their invention. Applicants further submit that such a practice is not appropriate to establish a rejection under §103(a). Yamanouchi Pharmaceutical Co., Ltd. V. Danbury Pharmacal, Inc., 231 F.3d 1339, 56 U.S.P.Q.2d 1641 (Fed. Cir.), reh'g denied, 2000 U.S. App. LEXIS 34047 (2000) ("Applicant's specification cannot be basis for motivation to combine"). Further, it is accepted that an ability to modify is insufficient. In re Laskowski, 871 F.2d 115, 117, 10 U.S.P.Q. 1397, 1399 (Fed. Cir. 1989).

Among other things, claim 1 now expressly calls for both a trench gate structure adjoining the first source region for controlling a sub-surface channel and a surface gate structure adjoining the first source region for controlling a surface channel.

It is clear that Tihanyi shows only a trench gate structure for controlling a sub-surface channel, and makes absolutely no suggestion to further include a surface gate structure for controlling a surface channel as called for in claim 1.

Additionally, Disney's FIG. 5 embodiment shows only a trench gate 63/64 for controlling a sub-surface channel, and Disney's FIG. 6 embodiment shows only a planar gate 44 for controlling a surface channel. When describing these two

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figures, Disney expressly states at column 8 lines 38-62 that FIGS. 5 and 6 are alternative embodiments that "involve replacing the gate and/or drain regions of the device with trench structures." No where does Disney show or suggest using both a planar gate and a trench gate in the same device as is called for in claim 1. Applicants respectfully submit that the term "replace" means to substitute, not to add, and this term actually teaches away from their invention.

Moreover, applicants submit that Disney's FIG. 12 embodiment cannot be used either because the surface structure in FIG. 12 is not a gate used to control a surface channel as called for in claim 1 because Disney's surface structure does not extend over source region 52. It only extends over body contact 151, which is the same conductivity type as p-body 130. Thus, there is no surface channel in FIG. 12 at all - only a vertical sub-surface channel controlled by trench gate 153/154. For at least these reasons, applicants submit that claim 1 is allowable over the cited references.

Claims 2, 3, 6, and 8 depend from claim 1 and are believed allowable for at least the same reasons as claim 1.

Claim 4 depends from claims 3 and 1 and further calls for a first doped region of the second conductivity type formed adjoining a portion of the sidewall surfaces [of the trench gate] and portions of the alternating layers and extending into the semiconductor region below the body region. Claim 4 is believed allowable for at least the same reasons as claims 3 and 1. Additionally, applicants respectfully submit that claim 4 is allowable because neither of the cited references show a first doped region of the second conductivity type formed adjoining a portion of

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the sidewall surfaces of the trench gate and portions of the alternating layers and extending below the body region. The present Office Action appears to rely on region 41 in Disney's FIG. 6 to teach this element. However, as is clearly evident in FIG. 6, region 41 does not adjoin a portion of the sidewall surfaces of the trench gate because there is no trench gate in FIG. 6. Further, region 41 clearly does not extend below body region 40 as is expressly called for in claim 4, but instead lies strictly within the body region. In addition, region 41 and body region 40 are the same conductivity type (i.e., first conductivity type), while claim 4 expressly calls for the first doped region to be a second conductivity type. Thus, applicants respectfully submit that claim 4 is allowable for these additional reasons.

Claim 9 depends from claim 1 and further calls for a drain extension region of the second conductivity type formed in the top layer and between the body region and the drain region and further contacting the drain region. Claim 9 is believed allowable for the same reasons as claim 1. Additionally, applicants respectfully submit that claim 9 is allowable because neither Tihanyi nor Disney show or suggest a drain extension region of the second conductivity type formed in the top and layer between the body the region and drain region and further contacting the drain region. In fact both references are completely silent on drain extension regions. Thus, applicants respectfully submit that claim 9 is allowable for this additional reason.

Claim 10 calls for a lateral MOSFET device comprising a semiconductor substrate, and a region of semiconductor material including a plurality of alternating layers of



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first and second conductivity semiconductor material formed overlying the semiconductor substrate and having a major surface. A trench drain structure is formed in the region of semiconductor material, and a body region of the first conductivity type is formed in the region of semiconductor material. A source region of the second conductivity type is formed in the body region. A trench gate structure is formed in the region of semiconductor material and adjoins at least portion of the alternating layers, the body region and the source region, wherein the trench gate structure controls a sub-surface channel region. Claim 10 further calls for a surface gate structure including a gate dielectric layer and a gate conductive portion formed overlying the major surface and adjacent the body region and the source region, wherein the surface gate structure controls a surface channel region.

I. Applicants first submit that there is no motivation to combine the Tihanyi and Disney.

Applicants first submit that there is no motivation to combine Tihanyi and Disney because the proposed combination of references would destroy the function of a reference, or in the alternative, there is direct conflict between the teachings of the two references. Specifically, in Tihanyi, the alternating layers 3 and 4 extend between and adjoin both the gate region 12/14 and the drain region 9. However, in Disney, the alternating p-type buried layers do not adjoin either the gate region nor the drain region. Further, as stated in Disney column 7, lines 47-60, this is done intentionally in order to improve the breakdown voltage of the Disney embodiment. In fact, Disney expressly states that the "P-type buried layer regions [are] surrounded

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above, below, and laterally by N-type material." Based on this express statement, applicants respectfully submit that there is no motivation to combine the references for any purposes because the function of the Disney device would be destroyed (i.e., degradation in breakdown voltage), or because there is direct conflict (i.e., degradation in breakdown voltage) between the teachings of the two references.

Moreover, the Tihanyi device employs a field shaping plate 15 embedded in a thick dielectric layer 16 overlying the entire surface of the Tihanyi device. Further, plate 15 extends all the way from the edge of gate 12/13 to the edge of drain 9. Applicants respectfully submit that there is no motivation to combine Tihanyi and Disney because the presence of plate 15 and thick dielectric layer 16 in the Tihanyi device teaches away from the surface gate device shown in Disney's FIG. 6 embodiment. Specifically, since the Tihanyi device is a trench gate sub-surface channel device only with a very thick dielectric layer 16 with an embedded field plate 15 overlying the entire major surface, this structure teaches away and provides no motivation to include a surface gate device for controlling a surface channel region.

In view of the above, applicants respectfully submit that a prima facie case of obviousness has not been presented, and that claims 10-16 are allowable for at least these reasons.

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II. Even if motivation existed, the two references still fail to show or suggest each element set forth in claim 10.

Assuming arguendo that there is motivation to combine the references, applicants respectfully submit that the Examiner has resorted to using their specification as a roadmap to pick and choose elements from the Disney reference when there is no motivation to do so absent their invention. Applicants further submit that such a practice is not appropriate to establish a rejection under §103(a). Yamanouchi Pharmaceutical Co., Ltd. V. Danbury Pharmacal, Inc., 231 F.3d 1339, 56 U.S.P.Q.2d 1641 (Fed. Cir.), reh'g denied, 2000 U.S. App. LEXIS 34047 (2000) ("Applicant's specification cannot be basis for motivation to combine"). Further, it is accepted that an ability to modify is insufficient. In re Laskowski, 871 F.2d 115, 117, 10 U.S.P.Q. 1397, 1399 (Fed. Cir. 1989).

Among other things, claim 10 expressly calls for a trench drain and both a trench gate structure for controlling a sub-surface channel that adjoins at least a portion of the alternating layers, the body region and the source region, and a surface gate structure for controlling a surface channel region formed overlying the major surface and adjacent the body region and the source region.

It is clear that Tihanyi only shows a trench gate structure for controlling a vertical sub-surface channel, and makes absolutely no suggestion to further include a surface gate structure for controlling a surface channel.

Additionally, Disney's FIG. 5 embodiment shows only a planar drain 47 with a trench gate 63/64, and Disney's FIG. 6 embodiment shows only a trench drain 67 with a planar gate 44. When describing these two figures, Disney expressly

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states at column 8 lines 38-62 that FIGS. 5 and 6 are alternative embodiments that "involve replacing the gate and/or drain regions of the device with trench structures." No where does Disney show or suggest using both a planar gate and a trench gate in the same device as is called for in claim 10. Applicants respectfully submit that the term "replace" means to substitute, not to add, and this term actually teaches away from their invention.

Moreover, applicants submit that Disney's FIG. 12 embodiment cannot be used either because the surface structure in FIG. 12 is not a gate used to control a surface channel as called for in claim 10 because Disney's surface structure is not adjacent source region 52. It is adjacent body contact 151 only, which is the same conductivity type as p-body 130. Thus, there is no surface channel in FIG. 12 at all, only a vertical sub-surface channel controlled by trench gate 153/154. For at least these reasons, applicants submit that claim 10 is allowable over the cited references.

Claim 11 depends from claim 10 and further calls for an extended drain region of the second conductivity type formed in a portion of the region of semiconductor material and extending from the major surface, and a top region of the first conductivity type formed in the extended drain region. Applicants respectfully believe that claim 11 is allowable for at least the same reasons as claim 10. Additionally, applicants respectfully submit that claim 11 is allowable because neither Tihanyi nor Disney show or suggest an extended drain region or top region formed in the extended drain region. In fact, both references are completely silent on these elements. Thus, applicants respectfully submit that claim 11 is allowable for this additional reason.

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Claim 12 depends from claim 10 and further calls for a doped region of the second conductivity type formed in the region of semiconductor material adjacent a portion of the trench gate structure and below the body region. Applicants respectfully believe that claim 12 is allowable for at least the same reasons as claim 10. Additionally, applicants respectfully submit that claim 12 is allowable over Tihanyi and Disney because neither reference shows or suggests the doped region called for in claim 12. The present Office Action appears to rely on region 41 in Disney's FIG. 6 to teach this element. However, as is clearly evident in FIG. 6, region 41 is not below body region 40 as is expressly called for in claim 12, but instead lies strictly within the body region. In addition, region 41 and body region 40 are the same conductivity type (i.e., first conductivity type), while claim 12 expressly calls for the doped region to be a second conductivity type. Thus, applicants respectfully submit that claim 12 is allowable for these additional reasons.

Claims 13-16 depend from claim 10 and are believed allowable for at least the same reasons as claim 10.

Claim 17 calls for an insulated gate FET structure comprising alternating layers of first and second conductivity type material forming a semiconductor region. A trench gate structure is formed in the alternating layers, wherein the trench gate structure controls a sub-surface channel region. A body region of the first conductivity type is formed in the semiconductor region adjacent the trench gate structure. A drain region of the second conductivity is formed in the semiconductor region and spaced apart from the trench gate structure and extends into

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the alternating layers. A source region of the second conductivity type is formed in the body region and adjacent to the trench gate structure. A doped region of the second conductivity type formed along a sidewall of the trench gate structure and extending into the semiconductor region below the body region.

I. Neither Tihanyi nor Disney show or suggest at least two express elements set forth in claim 17.

Applicants respectfully submit that neither Tihanyi nor Disney show or suggest at least a doped region of the second conductivity type formed along a sidewall of the trench gate structure and extending into the semiconductor region below the body region. The present Office Action appears to rely on region 41 in Disney's FIG. 6 to teach this element. However, as is clearly evident in FIG. 6, region 41 is not below body region 40 as is expressly called for in claim 12, but instead lies strictly within the body region. Further, region 41 is the same conductivity type as body region 40 (i.e., the first conductivity type), which is not a second conductivity type as is called for in claim 17. Thus, for at least these reasons, applicants respectfully submit that claim 17 is allowable over Tihanyi in view of Disney.

Claims 18-21 depend from claim 17 and are believed allowable for at least the same reasons as claim 17.

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In view of all of the above, it is believed that the claims are allowable, and the case is now in condition for allowance, which action is earnestly solicited.

Respectfully submitted,

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